

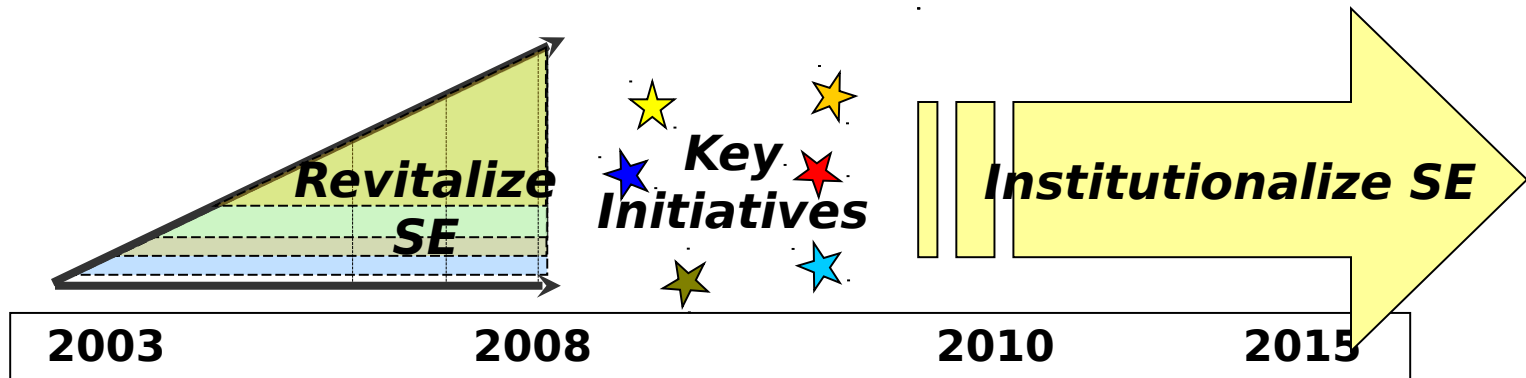


# Systems Engineering and Parts Management

*Systems and Software Engineering  
Office of the Deputy Under Secretary of Defense (A&T)  
PSMC Conference 28 October 2008*

# Briefing Outline

- OSD Systems Engineering Organization and Responsibilities
- Current Issues/Changes
- Parts Management/Logistics



# OUSD (AT&L) Organization

USD, Acquisition  
Technology & Logistics

DUSD, Acquisition &  
Technology

Dir, Joint Advanced  
Concepts

**Dir, Systems and  
Software Engineering**

Dir, Portfolio  
Systems Acquisition

Defense Acquisition  
University

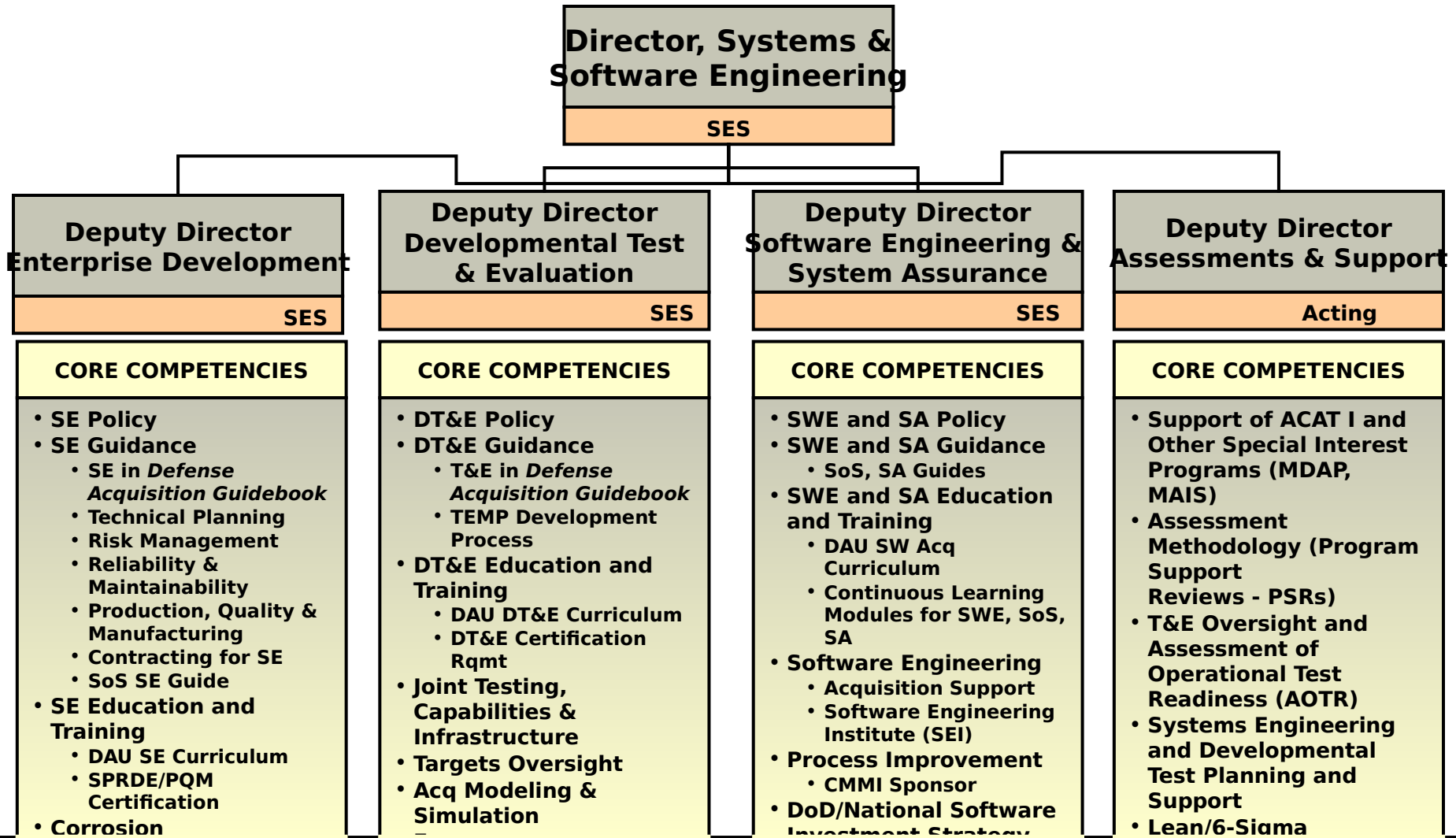
Defense Procurement  
and Acquisition Policy

Industrial  
Programs

Small Business  
Programs

Defense Contract  
Management Agency

# Systems and Software Engineering Organizational Core Competencies

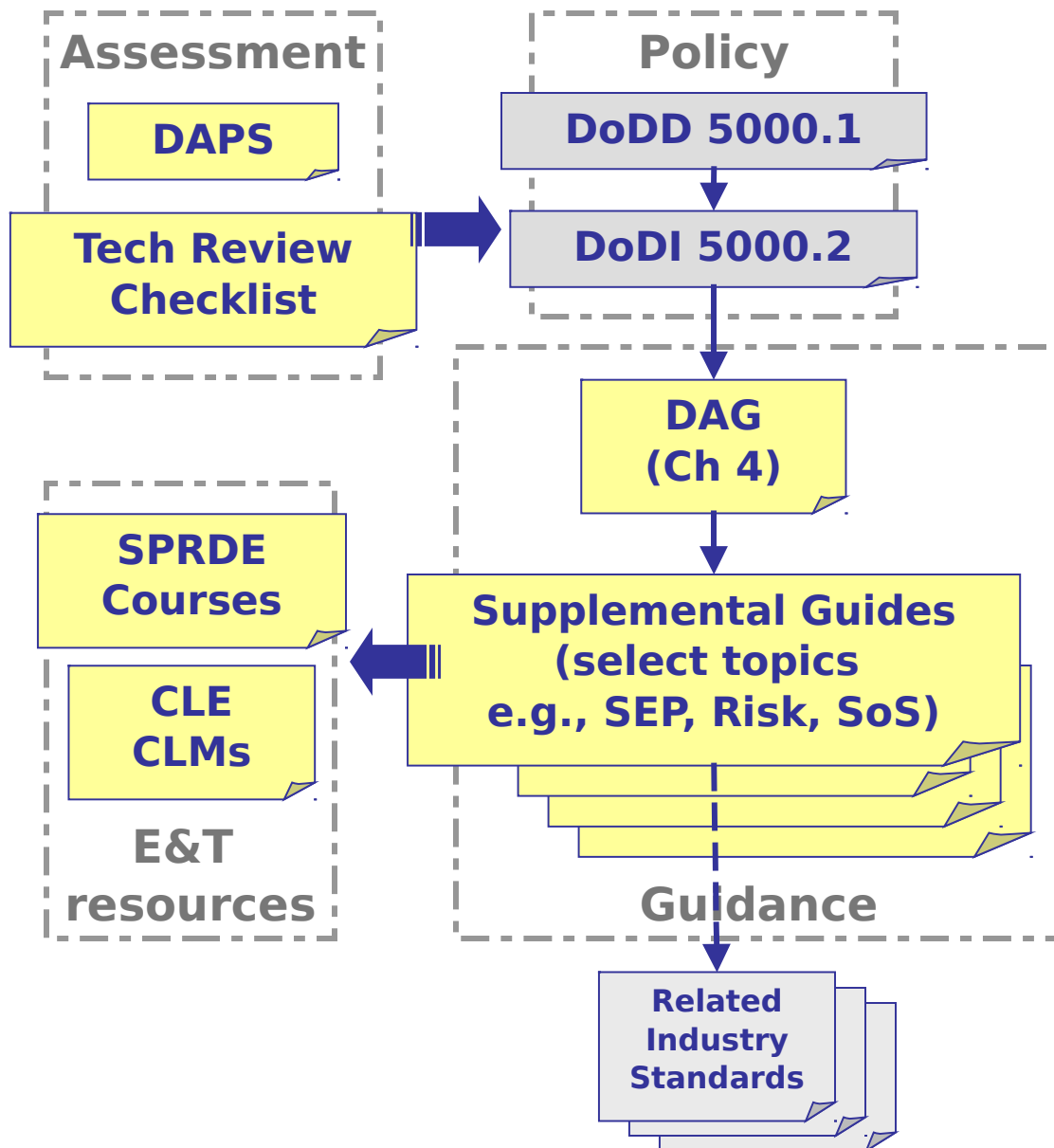


***Acquisition program excellence through sound systems and software engineering***

# SSE Functions

- Acquisition Program Support
  - Decision Support to Senior DoD Leadership
  - Mentoring Acquisition Programs
  - Technical Reviews of Key Program Documentation
- Policy, Guidance, Best Practices
- Acquisition Workforce Education and Training
  - SE, Test, and Production, Quality and Manufacturing
- Systemic Root Cause Analysis
- “Discipline” Expertise
  - ★ Risk
  - ★ Reliability
  - ★ Architectures
  - ★ Test/Eval
  - ★ CMMI
  - ★ Software
  - ★ Energy
  - ★ Safety
  - ★ Modeling/Simulation
  - ★ Assurance/Cyber
  - ★ Comm/Networking
  - ★ System of Systems

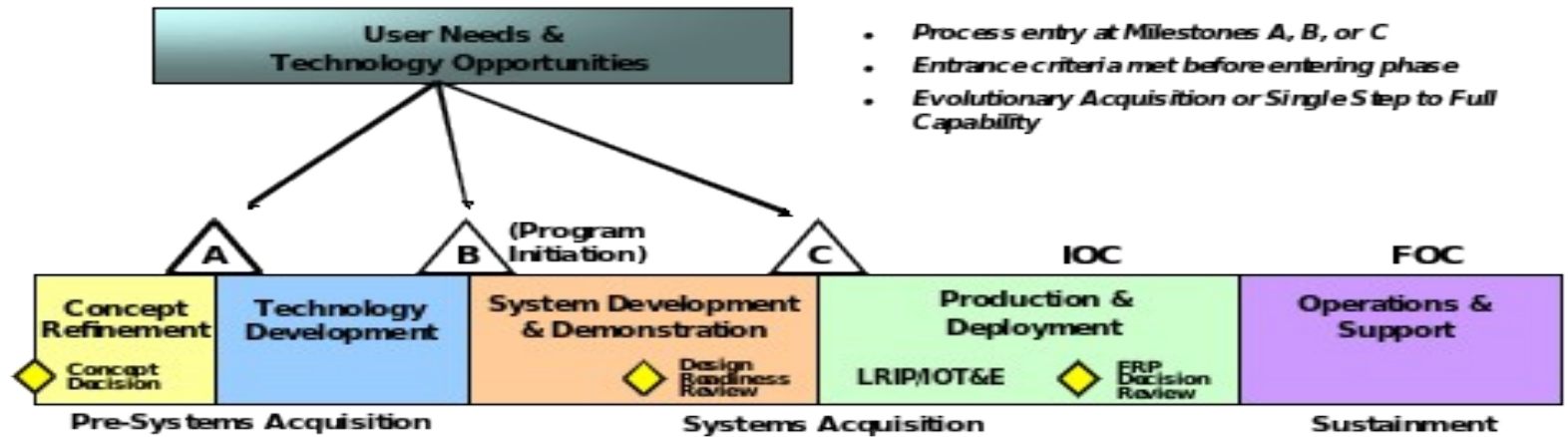
# Elements of SE Policy, Education and Training, Guidance and Assessment



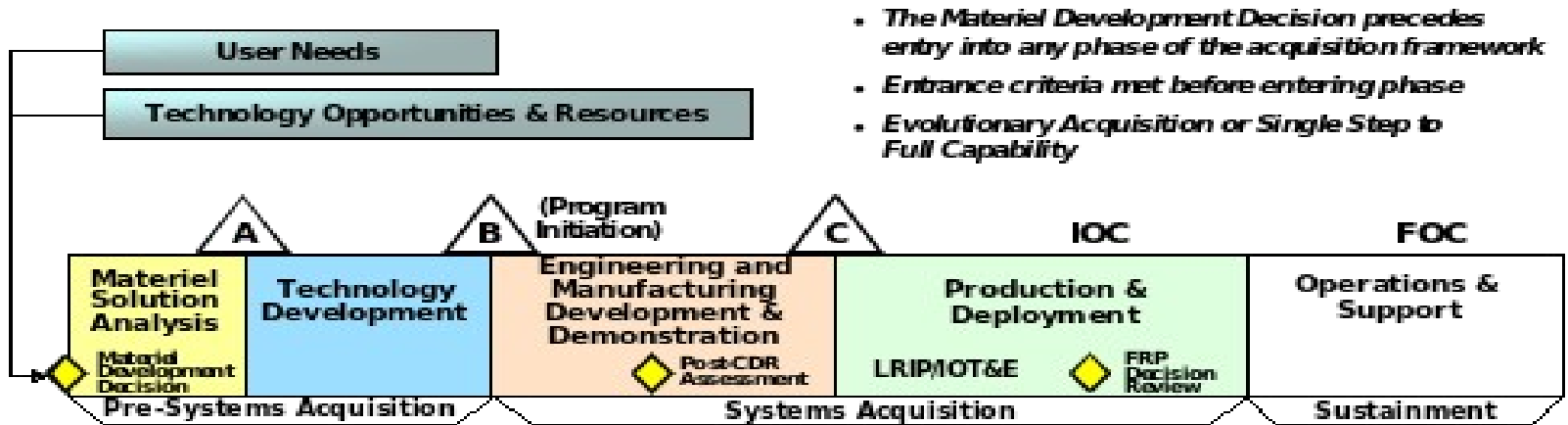
# Policy

# Subtle, But Substantial Changes

Old Life Cycle



New Life Cycle



◆ = Decision Point    ▲ = Milestone Review



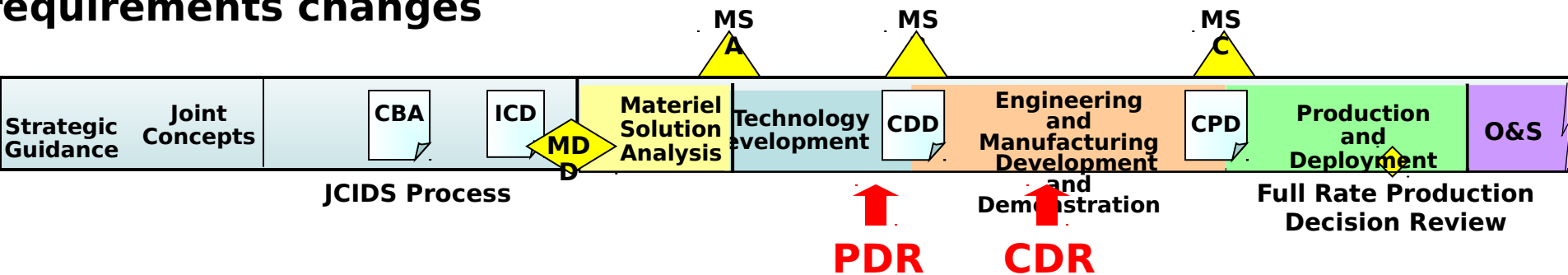
# Draft Acquisition Policy Changes

Mandatory Materiel Development Decision Review (MDD)

Mandatory competing prototypes before MS B

Mandatory PDR and a report to the MDA before MS B (*moves MS B to the r*)

Configuration Steering Boards at Component level to review all requirements changes



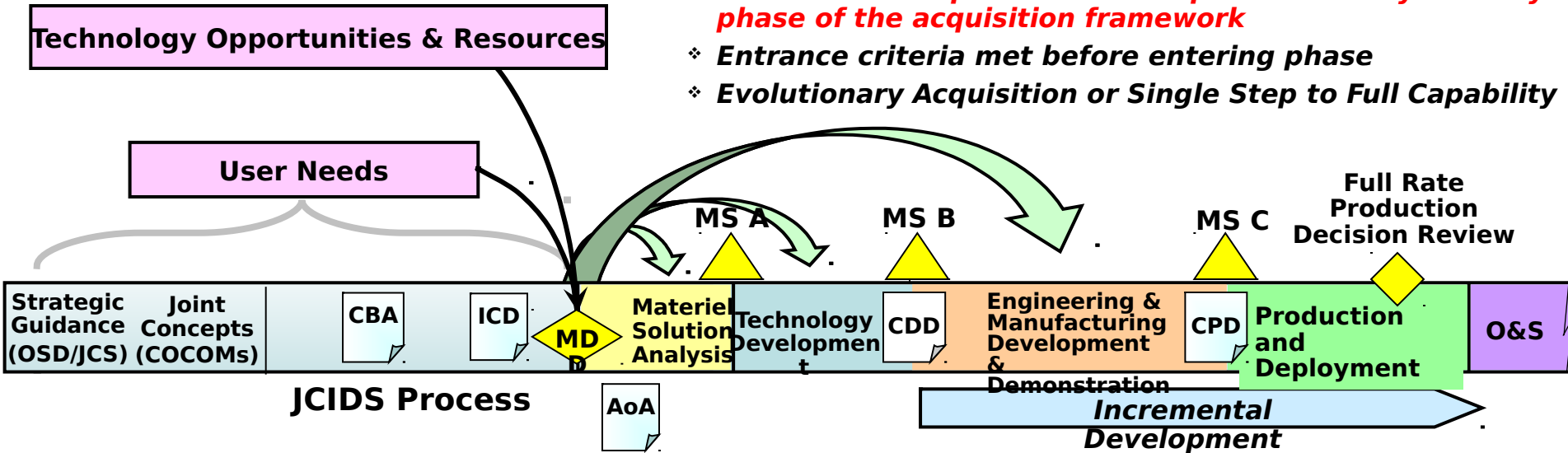
❖ **Renewed emphasis on manufacturing during system development:**

- Re-titles SDD phase to EMDD with two sub phases: **Integrated System Design and System Capability and Manufacturing Process Demonstration**
- Establishes consideration of manufacturing maturity at key decision points

❖ **Mandatory system-level CDR with an initial product baseline and followed by**

# Mandatory Materiel Development Decision

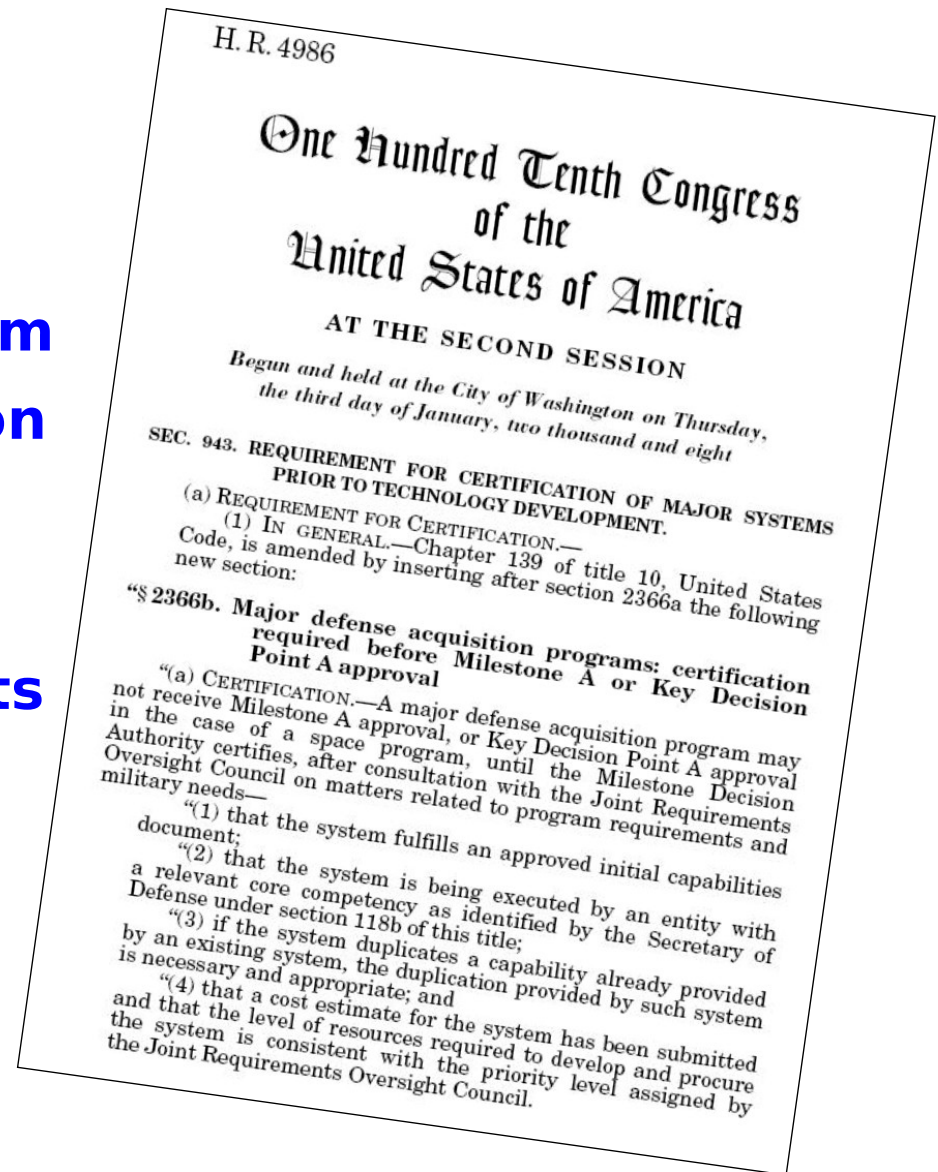
- ❖ **Materiel Development Decision precedes entry into any phase of the acquisition framework**
- ❖ **Entrance criteria met before entering phase**
- ❖ **Evolutionary Acquisition or Single Step to Full Capability**



*“ When the ICD demonstrates the need for a materiel solution, the JROC will recommend that the MDA consider potential materiel solutions. The MDA, working with appropriate stakeholders, shall determine whether it is appropriate to proceed with a Materiel Development Decision. . . . If the MDA decides that additional analysis is required, a designated office shall prepare, and the MDA shall approve, study guidance to ensure that necessary information is available to support the decision. . . . The Materiel Solution Analysis Phase begins with the Materiel Development Decision (MDD). The MDD is the formal entry point into the acquisition process and shall be mandatory for all programs. . . . At the MDD Review, the Joint Staff shall present the JROC recommendations and the DoD Component shall present the ICD including: the preliminary concept of operations, a description of the needed capability, the operational risk, and the basis for determining that non-materiel approaches will not sufficiently mitigate the capability gap. The Director, PA&E, shall propose study guidance for the AoA. . . . The MDA shall approve the AoA study guidance; determine the acquisition phase of entry; identify the initial review milestones and designate the lead DoD Component(s). The MDA decisions shall be*

# FY08 National Defense Authorization Act

- ❖ Mandates Milestone A approval prior to technology development for a major weapon system
- ❖ Requires MDA Certification prior to Milestone A for MDAPs
- ❖ Changed Milestone B Certification Requirements
- ❖ Mandates reporting and notification of program cost changes



# Prototyping and Competition

**“Evolutionary acquisition requires . . . Technology development preceding initiation of an increment shall continue until the required level of maturity is achieved, prototypes of the system or key system elements are produced, and a preliminary design is completed. . . .”**

**“The TDS and associated funding shall provide for two or more competing teams producing prototypes of the system and/or key system elements prior to, or through, Milestone B.”**



ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3010

19 SEP 2007

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS  
CHAIRMAN OF THE JOINT CHIEFS OF STAFF  
COMMANDER, U.S. SPECIAL OPERATIONS COMMAND  
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Prototyping and Competition

Many troubled programs share common traits – the programs were initiated with inadequate technology maturity and an elementary understanding of the critical program development path. Specifically, program decisions were based largely on paper proposals that provided inadequate knowledge of technical risk and a weak foundation for estimating development and procurement cost. The Department must rectify these situations.

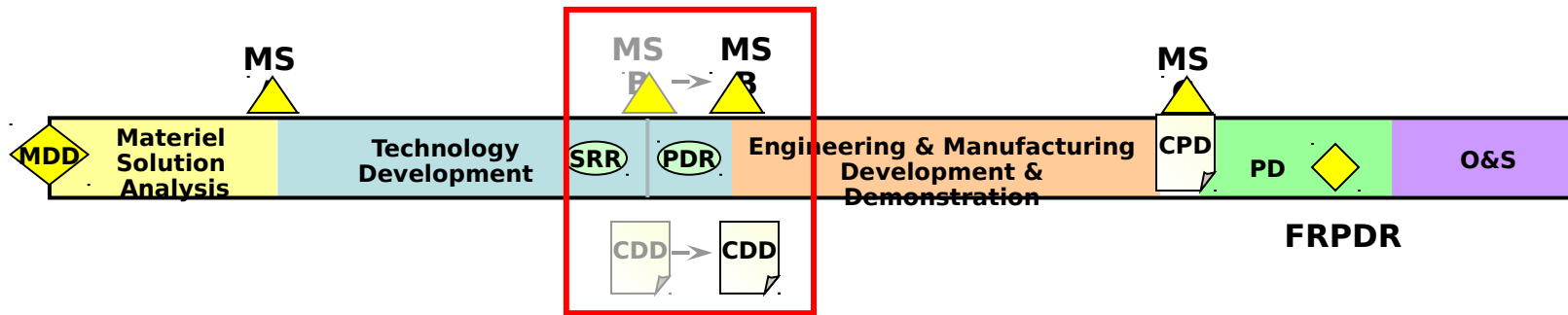
Lessons of the past, and the recommendations of multiple reviews, including the Packard Commission report, emphasize the need for, and benefits of, quality prototyping. The Department needs to discover issues before the costly System Design and Development (SDD) phase. During SDD, large teams should be producing detailed manufacturing designs – not solving myriad technical issues. Government and industry teams must work together to demonstrate the key knowledge elements that can inform future development and budget decisions.

To implement this approach, the Military Services and Defense Agencies will formulate all pending and future programs with acquisition strategies and funding that provide for two or more competing teams producing prototypes through Milestone (MS) B. Competing teams producing prototypes of key system elements will reduce technical risk, validate designs, validate cost estimates, evaluate manufacturing processes, and refine requirements. In total, this approach will also reduce time to fielding.

Beyond these key merits, program strategies defined with multiple, competing prototypes provide a number of secondary benefits. First, these efforts exercise and develop government and industry management teams. Second, the prototyping efforts provide an opportunity to develop and enhance system engineering skills. Third, the programs provide a method to exercise and retain certain critical core engineering skills in the government and our industrial base. Fourth, prototype efforts can attract a new generation of young scientists and engineers to apply their technical talents to the needs of our Nation's Warfighters. Finally, these prototype efforts can inspire the imagination and creativity of a new generation of young students, encouraging them to pursue technical educations and careers.



# Preliminary Design Review Precedes MS B



<b>CHARACTERISTICS</b>	MS B moved “to the right” to allow contractor preliminary design to inform requirements, estimated costs, and schedule.
<b>PROCESS</b>	Technology Development extended through formal Preliminary Design Review (PDR). Preliminary design based on DRAFT CDD to facilitate trades before JROC approval. Competitive environment sustained up to and perhaps through MS B. MDA conducts MS B review as described in current policy.
<b>SUPPORTING INFORMATION</b>	PDR Report from PM. Current statutory and regulatory information

## BENEFITS

- ❖ Ties program decision to event-based (product-based) technical review
- ❖ Most derived requirements surfaced
- ❖ Better understanding of cost, schedule, and performance risk when the APB is approved and SAR reporting begins
- ❖ Opportunity for MDA to defer (in coordination with requirements authority) unachievable requirements to next increment
- ❖ Final requirements informed by detailed design
- ❖ Early indicator of manufacturing and production issues

# **New Systems Engineering Enclosure 12**

- ❖ **Codifies three previous SE policy memoranda**
- ❖ **Codifies a number of SE-related policies and Statutes since 2003:**
  - **Environment, Safety, and Occupational Health**
  - **Corrosion Prevention and Control**
  - **Modular Open Systems Approach**
  - **Data Management and Technical Data Rights**
  - **Item Unique Identification**
  - **Reliability, Availability, and Maintainability**
- ❖ **Introduces new policy on Configuration Management**

# Guidance

# Systems and Software Engineering Guidance

## - What's available:

- Systems Engineering Plan (SEP) Preparation Guide, V2
- Guide to Integrating SE into DoD Acquisition Contracts
- Risk Management Guide for DoD Acquisition
- Risk Assessment Technical Review Checklists
- DoD Guide for Achieving Reliability, Availability, and Maintainability
- Integrated Master Plan/Integrated Master Schedule (IMP/IMS) Guide
- Understanding and Leveraging a Supplier's CMMI Efforts: A Guidebook for Acquirers
- Systems of Systems SE Guide

## - What's coming:

- Update to Defense Acquisition Guidebook
- Software Assurance Guide

***SSE Website: <http://www.acq.osd.mil/sse/>***



# Defense Acquisition Guide Update

## Ongoing

- Chapter Authors Revise DAG Based on Most Current Draft of DoDI 5000.02
- Drafts of Each Chapter Coordinated “Internally and Externally”
- SD-106 Coordination of 5000.02 Complete
- Finalized Draft DAG Chapters Sent to DPAP For Comment/Coordination

## Need to Complete

- New 5000.02 Signed and Delivered to DAU for Posting in .pdf Format on Existing Guidebook Application Website
- Initiate and Complete Formal Coordination of Entire DAG
- Final DAG Approved and Sent to DAU for Posting in .pdf Format on Existing Guidebook Application Website
- DAU Completes Interactive Version of All Documents on New ACC Website
- Final On-line Review

# **DAG Chapter 4 Changes**

- **Overall Structure of the Chapter is Unchanged**
- **Incorporate Changes from DoDI 5000.02 Policy**
- **Promote Early/Enhanced Systems Engineering**
- **Fix Corrections, Omissions and Gain Currency**
- **Seek Consistency with Other DAG Chapters**

# DAG Chapter 4 Changes

- 4.1 Systems Engineering in DoD Acquisition
  - Provided overview information on SE leadership, support to PMs, and SE Working-level IPT
- 4.2 Systems Engineering Processes: How Systems Engineering is Conducted
  - Aligned to incorporate relevant updates to ISO/IEC Standard 15288 Systems and software engineering - system life cycle processes
- 4.3 Systems Engineering Activities in the System Life Cycle
  - Materiel Solution Analysis Phase
  - Technology Development Phase (PDR Report )
  - Engineering and Manufacturing Development and Demonstration Phase (CDR Report)
- 4.4 Systems Engineering Execution: Key Systems Engineering Tools and Techniques
  - Updated 'Design Considerations' and added Parts Management, DMSMS, Program Protection and System Assurance

# Education and Training

# SE/PQM Education and Training

- Re-coding of program level engineering specialty positions to Program Systems Engineer (PSE) is in progress across the Services.
  - Added additional training and experience requirements
    - Focus on enhancing SE in the early phases of acquisition
    - Broaden the competency set to include other career fields (e.g., PM, Logistics, Contracting)
    - Double the years of experience required for each DAWIA certification level
- Assisting on DAU's "Requirements Manager" training curriculum for Joint Staff/Services personnel who develop and manage requirements
- Conducting Systems Engineering Competency Assessment in late 2008/early 2009 for SE and PQM

# Parts Management/Logistics

# DAG Chapter 4 Proposed Changes to Address Parts Management

- An overview of the goals of Part Management
  - Reduce logistics footprint and lower total life cycle costs
  - Mitigate parts obsolescence due to DMSMS
- What a part is and its relationship to other system elements and CI's
- Discussion of parts management strategy
  - Consideration over the entire life cycle of a system
  - Based on the fundamental SE technical and technical management processes
    - Configuration management, technical assessment, decision analysis, design solution, implementation, verification and evaluation at technical reviews
  - A Parts Management Plan should be documented in the SE Plan
- Parts selection should be based on trade-offs and cost-benefit analysis
- References MIL-STD-3018, SD-19 and industry guides for additional implementation details

# Parts Management Considerations for the Updated Defense Acquisition System

- Updated system has a more disciplined AoA process as part of the Materiel Solution Analysis
  - To what extent should there be parts management considerations in the early systems engineering effort?
  - Should parts management be called out in the AoA study plan?
- Updated system has formal competitive prototyping in Technology Development to demonstrate mature technology and performance
  - What is the appropriate parts management role for a technology demonstration? For a prototype? How does it differ?
  - To what extent do parts management considerations differ between a sub-system prototype and a full-system prototype?
- Configuration management responsibilities not fully defined in a competitive prototyping environment
  - How does this affect parts management?



# Reliability

## Background

- DUSD(A&T) Memo, 15 Feb 08 requested CAEs establish a Reliability Improvement Working Group (RIWG) to:
  - Ensure programs are formulated to execute a viable systems engineering strategy from the beginning, including a RAM growth program, as an integral part of design and development.
  - Ensure government organizations reconstitute a cadre of experienced T&E and RAM personnel
  - Implement mandated integrated DT and OT, including the sharing and access to all appropriate contractor and government data and the use of operationally representative environments in early testing.
- Final Report of the DSB Task Force on Development Test and Evaluation, 27 May 08
  - Recommended that RAM, including a robust reliability program with an established reliability growth approach, be a mandatory contractual requirement and be addressed at every major program review.

# Reliability

## USD(AT&L) Memo to SAEs, 21 July 08

- Directed Components to establish a reliability improvement acquisition policy; and report back in 30 days
- Component Policy shall:
  - Ensure effective collaboration between the requirements and acquisition communities in the establishment of RAM requirements that balance funding and schedule while ensuring system suitability and effectiveness in the anticipated operating environment.
  - Ensure development contracts and acquisition plans evaluate RAM during system design.
  - Evaluate the maturation of RAM through each phase of the acquisition life cycle.
  - Evaluate the appropriate use of contract incentives to achieve RAM objectives.
- Established DoD policy:
  - Programs execute a viable RAM strategy that includes a reliability growth program as an integral part of design and development.
  - RAM shall be integrated within the Systems Engineering processes, documented in the program's Systems Engineering Plan and Life Cycle Sustainment Plan, and assessed during technical reviews, test and evaluation, and Program Support Reviews.

# Reliability

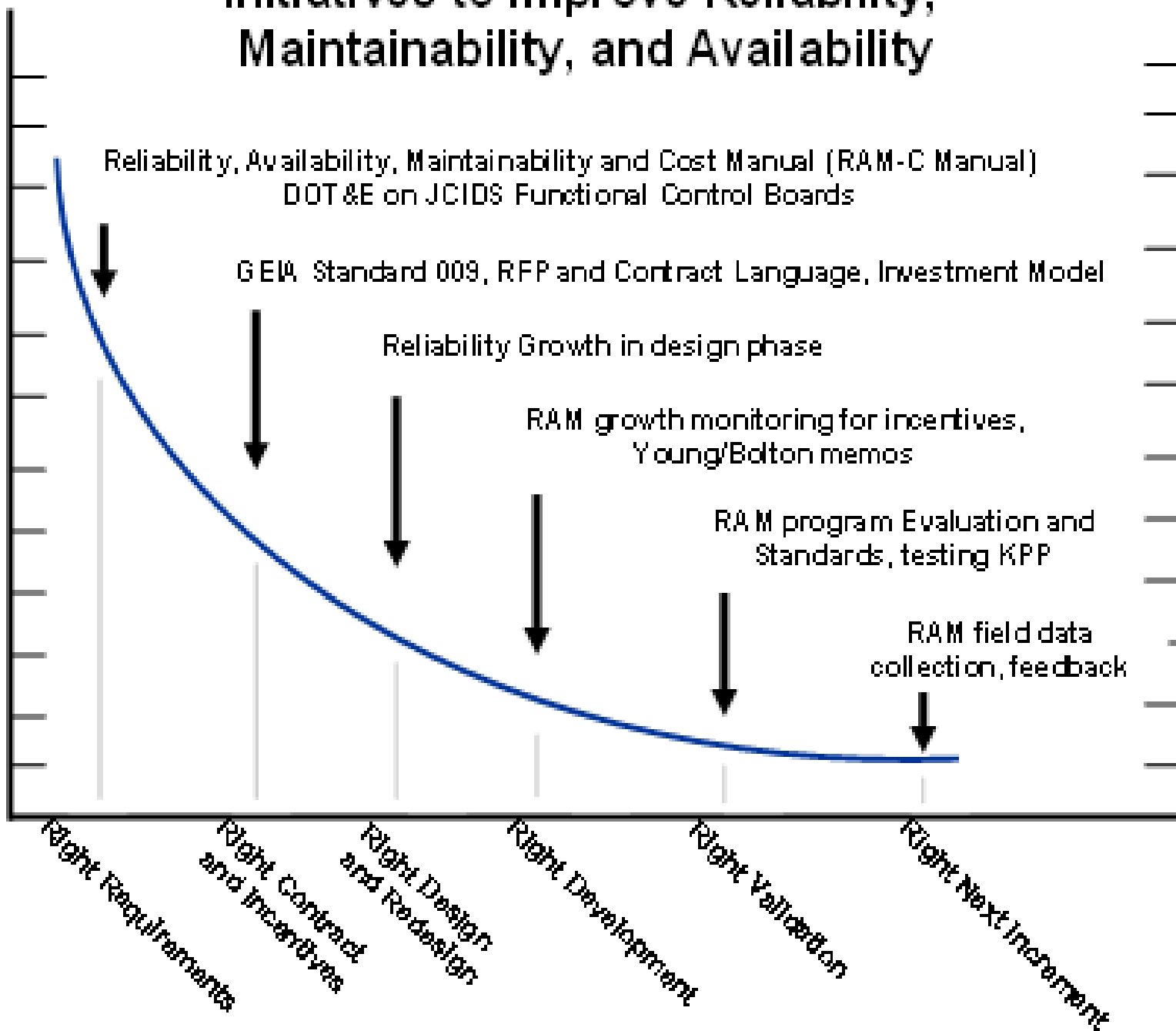
## RIWG Report

- Ensure programs are formulated to execute a viable systems engineering strategy from the beginning, including a RAM growth program, as an integral part of design and development.
  - **Establish Reliability Improvement Policy**
  - **Develop Sample Reliability Language for Acquisition Contracts**
  - **Guidance for Early RAM Planning**
  - **Define Standard Criteria to Evaluate a Reliability Program**
  - **Designate Reliability Champions Across DoD**
- Ensure government organizations reconstitute a cadre of experienced T&E and RAM Personnel
  - **Establish policy to enable RAM and T&E workforce reconstitution**
  - **Assure current Training and Education for the workforce**
- Implement mandated integrated DT and OT, including the sharing and access to all appropriate contractor and government data and the use of operationally representative environments in early testing.
  - **Guide on Incorporating T&E in Acquisition Contracts**
  - **Draft DAG Chapter 9 Integrated Testing content and TEMP update complete**
  - **RIWG Chairs requested formal response to Integrated Test efforts**

# Initiatives to Improve Reliability, Maintainability, and Availability

Number of Failures in the Field

Ownership Cost



# **Product Support Assessment Team**

- **Team Stood Up in Early October 08**
- **Will Identify Areas to Recommend What Initiatives That L&MR Should Be Focusing On**
- **Goal is to Provide Direction to Incoming AT&L**

# Summary

- Many initiatives are flowing down from OSD
- SSE working to ensure Parts Management becomes properly integrated with systems engineering and acquisition program oversight
  - Incorporation into Systems Engineering chapter of Defense Acquisition Guide
  - Incorporation as consideration in Technical Planning
  - Participation on various documents to assist the acquisition community to better address Parts Management (i.e. Risk Checklists, MIL-STD-3018, CLM, SD-19)